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identical xerophytic characters occur under a wide range of external conditions that are physiologically equivalent.

CARLTON C. CURTIS

The Principles of Direct-current Electrical Engineering. By JAMES R. BARR, A.M.I.E.E., Lecturer in Electrical Engineering, Heriot-Watt College, Edinburgh. New York, The Macmillan Company; London, Whittaker & Co. 1908. Pp. viii + 551; 294 illustrations.

There are several ways in which the general subject of electrical engineering may be divided for study or treatment in text-books. One very general scheme is first to take up the study of direct-current phenomena as applied to direct-current machinery, then to consider the study of alternating currents and alternating-current machinery, and finally to study the subject of transmission and distribution of power by both direct and alternating currents. A second method of division is to consider direct currents as a special case of periodic currents and to make the general division of the study of generators and receivers between induction apparatus and synchronous machines. Here again the subject of transmission and distribution is treated after a study of the machinery of both classes. A third classification consists of dividing the general subject into direct-current engineering and alternating-current engineering, treating under each head the generators, receivers, and systems of distribution utilizing direct currents or alternating currents as the case may be. For those who prefer the third classification the author has prepared a volume on the first division which should find a considerable application in colleges and technical schools.

The general method of treatment is not different from that used by other authors who prefer to consider direct-current engineering as separate from alternating-current phenomena. The first chapter is devoted to a review of the subject of units used, the relation of all practical units to the fundamental units being carefully stated. This is followed by

chapters dealing with the laws of the electric circuit and the magnetic circuit, but before the application of these laws to the direct-current generator is taken up in detail a carefully written chapter on measuring instruments, in which the principle of operation and the sources of error of most of the instruments in common use are considered, is introduced, and this is followed by a brief study of the storage battery, electric lighting and cables. Three chapters are devoted to the direct-current generator, and in these three chapters the author has placed in a logical manner most of the information desired by those not interested directly in the details of designing. The subjects of motors and boosters are similarly treated and the book is completed by chapters on testing and electricity control, the final chapter setting forth the general principles involved in the design of the switchboard and of protective apparatus.

From the beginning the book deals primarily with the principles involved, the details of apparatus being introduced as illustrations of the manner in which the principles are applied rather than for the purpose of furnishing a catalogue of apparatus. To further aid the student in making application of general principles to calculations, carefully prepared problems with their complete solutions are introduced at intervals throughout the text, and similar problems for solution by the students themselves are stated in an appendix. The problems as given are practical and the illustrations of machinery and instruments are taken from modern practise. The use of two colors in the diagrams of armature windings and other connections should aid the student greatly in his study of the subject. The index of the book is complete enough to make it a ready work of reference.

GEO. C. SHAD

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
June 26, 1908

SCIENTIFIC JOURNALS AND ARTICLES

The Journal of Experimental Zoology, Vol. V., No. 4 (June, 1908), contains the following papers: